$x10^{-5}$ in/in°F at 250°F.

One preferred thermoplastic material, Konduit OTF212-11, was made into a thermoplastic body and tested for its coefficient of linear thermal expansion by a standard ASTM test method. It was found to have a CLTE in the range of –30 to 60 °C of $1.09x10^{-5}$ in/in°F in the X direction and $1.26x10^{-5}$ in/in°F in both the Y and Z directions, and a CLTE in the range of 100 to 240°C of $1.28x10^{-5}$ in/in°F in the X direction and $3.16x10^{-5}$ in/in°F in both the Y and Z directions. (Hence, the relevant CLTEs for purposes of defining the invention are 1.09×10^{-5} in/in°F and 1.28×10^{-5} in/in°F.) Another similar material, Konduit PDX –0988, was found to have a CLTE in the range of –30 to 30°C of $1.1x10^{-5}$ in/in°F in the X direction and $1.46x10^{-5}$ in/in°F in both the Y and Z directions, and a CLTE in the range of 100 to 240°C of $1.16x10^{-5}$ in/in°F in the X direction and $3.4x10^{-5}$ in/in°F in both the Y and Z directions. By contrast, a PPS type polymer, (Fortron 4665) was likewise tested. While it had a low CLTE in the range of –30 to 30°C ($1.05x10^{-5}$ in/in°F in the X direction and 1.33x10-5 in/in°F in both the Y and Z directions), it had a much higher CLTE in the range of 100 to 240°C ($1.94x10^{-5}$ in/in°F in the X direction and $4.17x10^{-5}$ in/in°F in both the Y and Z directions).

In addition to having a desirable CLTE, the preferred phase change material will also have a high thermal conductivity. A preferred thermoplastic material will have a thermal conductivity of at least 0.7 watts/meter°K using ASTM test procedure F 433 and tested at room temperature (23°C).

Referring to FIG. 5, an injection molding machine is used to manufacture a hard disc drive or hard disc drive components having a reproducible resonance

spectrum. The injection molding machine is similar to the machines used conventionally in thermoplastic injection molding processes. A unique aspect of this invention is the method for injection molding a layer of phase change material onto the hard disc drive or hard disc drive components. The injection molding apparatus suitable for use in the method provided by the present invention comprises an injection cylinder 12 having a resin feeding screw 13 inside, a mold cavity 22, an runner 65, a stroke sensor 60 and pressure transducers P1, P2 and P3.

The molten material flows into the mold cavity 22 via runners 65. Gates are placed at the end of the runner to control the flow of molten material into the mold cavity. Valve gate 50 opens and closes the runner 65 to the cavity 22. Suitable valve gates are any valves known in the injection molding art.

However, it is also possible to perform the method of the present invention without the use of a valve gate. In a process where no valve gates are used, the molten material is kept at a predetermined pressure in the mold cavity and is allowed to solidify. The mold cavity is opened and the part and the solidified material in the runner are ejected and then separated. The use of a valve gate eliminates the need for the separating step.

In a preferred embodiment, a hard disc drive component such as a voice coil motor, spindle motor or stator is insert molded with a monolithic body of phase change material to obtain a component with a reproducible resonance spectrum. In the alternative, a hard disc drive with a base, spindle motor assembly and actuator assembly can be insert molded with a monolithic body of phase change material to obtain a reproducible resonance spectrum. In one embodiment,

as illustrated in FIG. 6a and FIG. 6b, a stator is placed into a mold cavity 22. The mold cavity is designed to hold the stator and form a predetermined shape. Retractable pins 76 hold the stator in place during the injection molding process. They are later retracted once the mold cavity is filled with phase change material. The injection molding method begins with closing the mold cavity as illustrated in FIG. 6b and opening the valve gates 50. Molten material 55 fills cavity 22. A stroke sensor 60 measures the rate of plastic injection. A controller 70 correlates this rate, the compressibility of the plastic and the size of the injection unit to determine a quantity of plastic injected with time. A pressure transducer P1 is associated with the beginning-of-fill point and is placed near the gate 50 of the mold cavity 22. The beginning-of-fill point is the first portion of a mold cavity that is filled by molten material. Thus, the pressure transducer P1 is preferably placed within the first ten percent of the mold cavity to be filled by molten material. Another pressure transducer P2 is associated with the end-of-fill point in cavity 22. The end-of-fill point is the last portion of a mold cavity that is filled by molten material. Thus, the pressure transducer P2 is preferably placed within the last ten percent of the mold cavity to be filled by molten material. Also a pressure transducer P3 is placed in the runner 65 to monitor the runner pressure. The stroke sensor 60, as illustrated in FIG. 5, measures the fill rate of the molten phase change material.

Molten material enters through the gate and quickly fills up the entire cavity. The stroke sensor 60 and pressure transducers P1, P2, and P3 transmit their respective readings to a controller 70, as illustrated in FIG. 5, which is